

# AMSER Rad Path Case of the Month:

## 21 y.o. male with right shoulder pain

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# Patient Presentation

21 y.o. male with no significant PMH presenting with intermittent right shoulder pain

## HPI

- Intermittent pain after strenuous activity for past few days. Progressive posterior shoulder fullness for past few years.
- No fevers, chills, or recent weight loss.

## Physical exam (RUE)

- Skin intact, warm and well perfused. Firm soft tissue mass posterior shoulder, causing asymmetry.
- Motor grossly present in axillary, anterior interosseous, posterior interosseous, and ulnar distributions.
- Sensation present to light touch in axillary, median, radial, and ulnar distributions. No numbness or tingling.

## Labs

- All within normal limits.

# ACR Appropriateness Criteria

**Variant 1:**

**Adult or child. Suspected primary bone tumor. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography area of interest	Usually Appropriate	Varies
US area of interest	Usually Not Appropriate	○
MRI area of interest without and with IV contrast	Usually Not Appropriate	○
MRI area of interest without IV contrast	Usually Not Appropriate	○
Bone scan whole body	Usually Not Appropriate	☼☼☼
Bone scan whole body with SPECT or SPECT/CT area of interest	Usually Not Appropriate	☼☼☼
FDG-PET/CT whole body	Usually Not Appropriate	☼☼☼☼
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies
CT area of interest without IV contrast	Usually Not Appropriate	Varies

# Right XR Shoulder (Unlabeled)

AP Internal Rotation



Grashey View

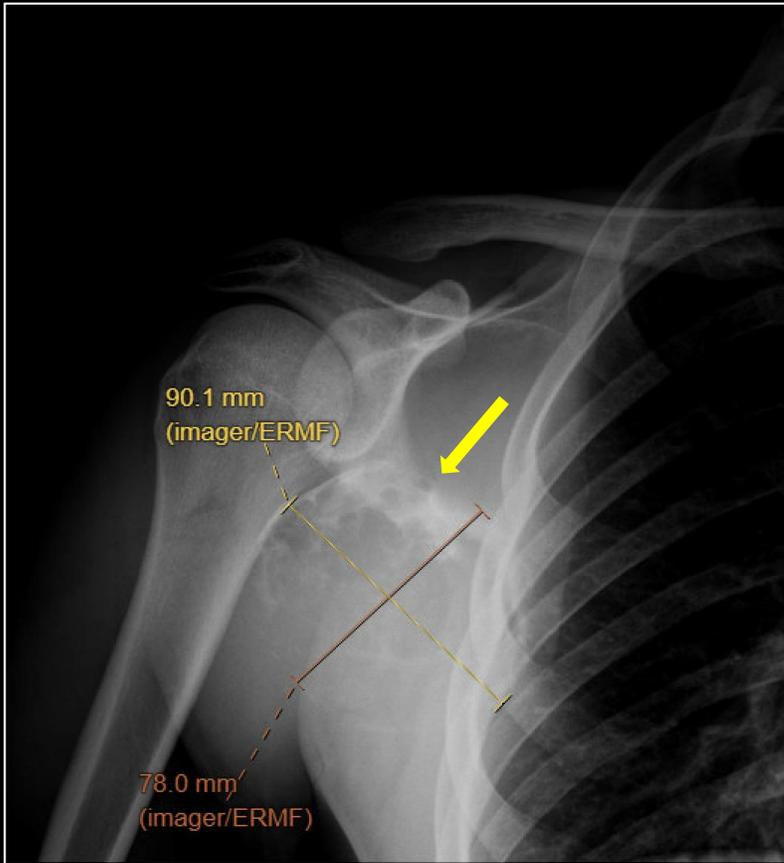


Axillary View

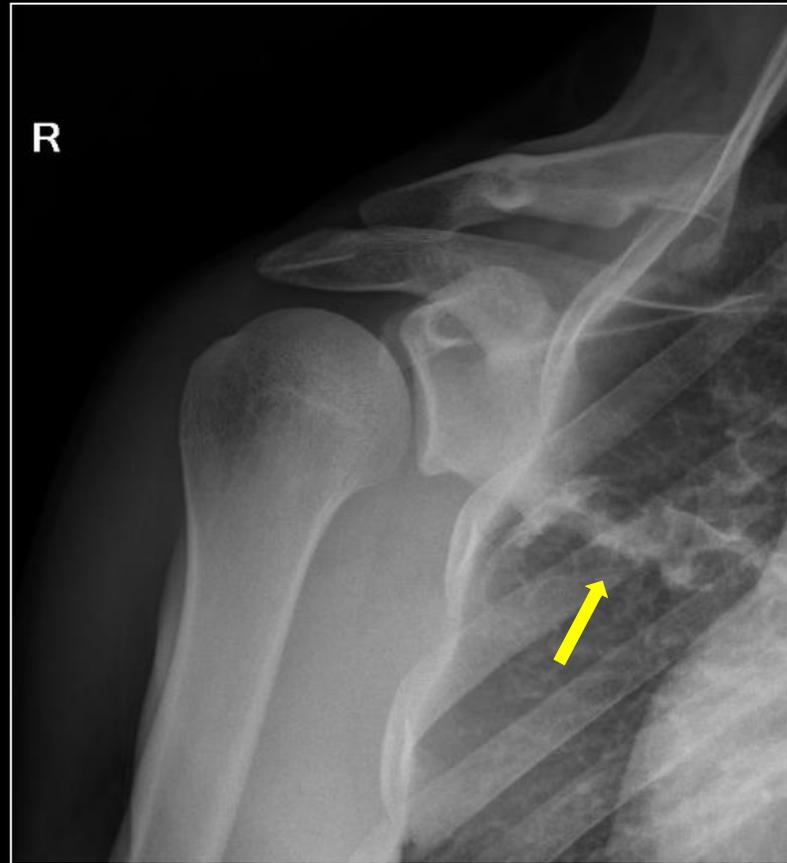


# Right XR Shoulder (Labeled)

AP Internal Rotation



Grashey View



Axillary View

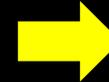


9.0 x 7.8 cm exophytic predominantly lytic lesion with internal mineralization arising likely from the scapula. No acute fracture or dislocation.

# ACR Appropriateness Criteria

**Variant 1:** Adult or child. Suspected primary bone tumor. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography area of interest	Usually Appropriate	Varies
US area of interest	Usually Not Appropriate	○
MRI area of interest without and with IV contrast	Usually Not Appropriate	○
MRI area of interest without IV contrast	Usually Not Appropriate	○
Bone scan whole body	Usually Not Appropriate	⊕⊕⊕
Bone scan whole body with SPECT or SPECT/CT area of interest	Usually Not Appropriate	⊕⊕⊕
FDG-PET/CT whole body	Usually Not Appropriate	⊕⊕⊕⊕
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies
CT area of interest without IV contrast	Usually Not Appropriate	Varies



**Variant 5:** Adult or child. Suspected primary bone tumor. Lesion on radiographs. Indeterminate or aggressive appearance for malignancy. Next imaging study.

Procedure	Appropriateness Category	Relative Radiation Level
MRI area of interest without and with IV contrast	Usually Appropriate	○
MRI area of interest without IV contrast	Usually Appropriate	○
FDG-PET/CT whole body	Usually Appropriate	⊕⊕⊕⊕
Bone scan whole body with SPECT or SPECT/CT area of interest	May Be Appropriate	⊕⊕⊕
CT area of interest with IV contrast	May Be Appropriate	Varies
CT area of interest without and with IV contrast	May Be Appropriate	Varies
CT area of interest without IV contrast	May Be Appropriate	Varies
US area of interest	Usually Not Appropriate	○
Image-guided biopsy area of interest	Usually Not Appropriate	Varies
Bone scan whole body	Usually Not Appropriate	⊕⊕⊕

# CT Chest (Unlabeled)

Axial View

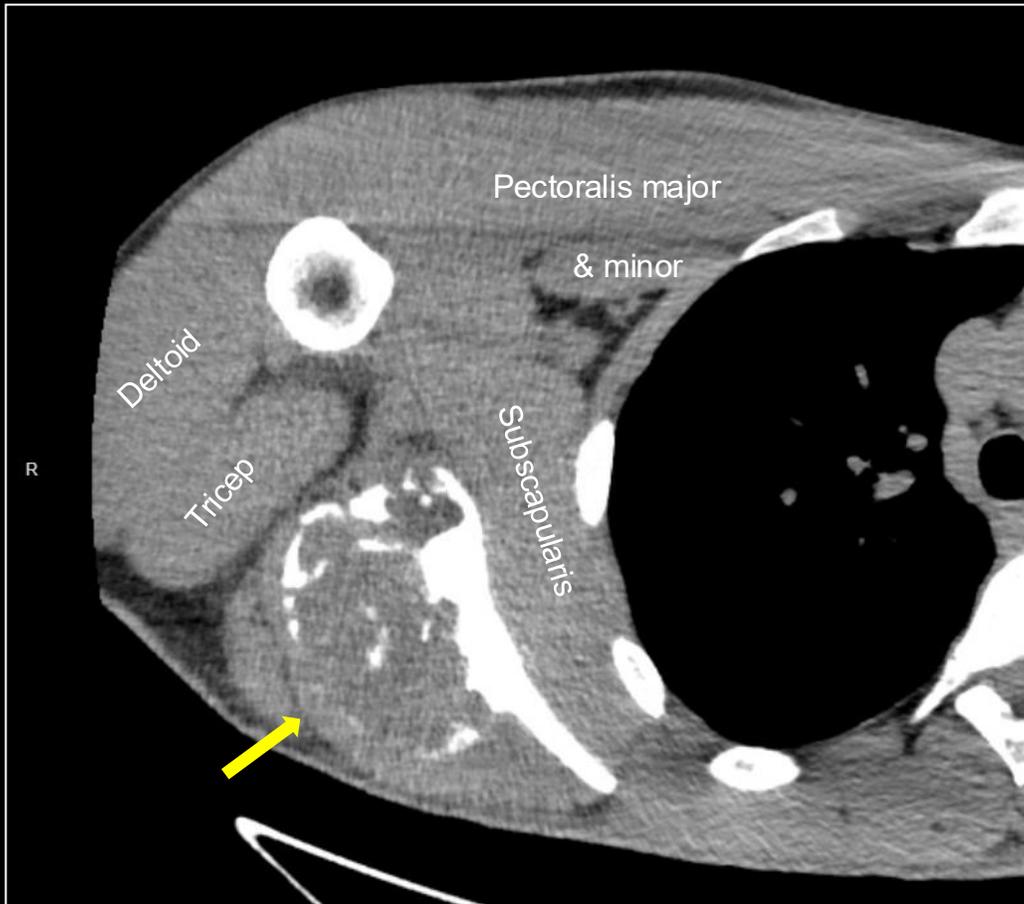


Coronal View



# CT Chest (Labeled)

Axial View



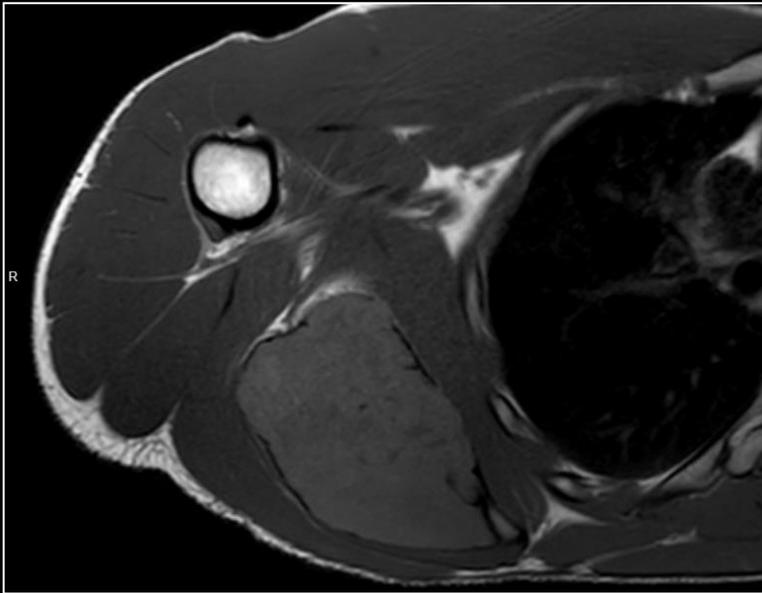
Coronal View



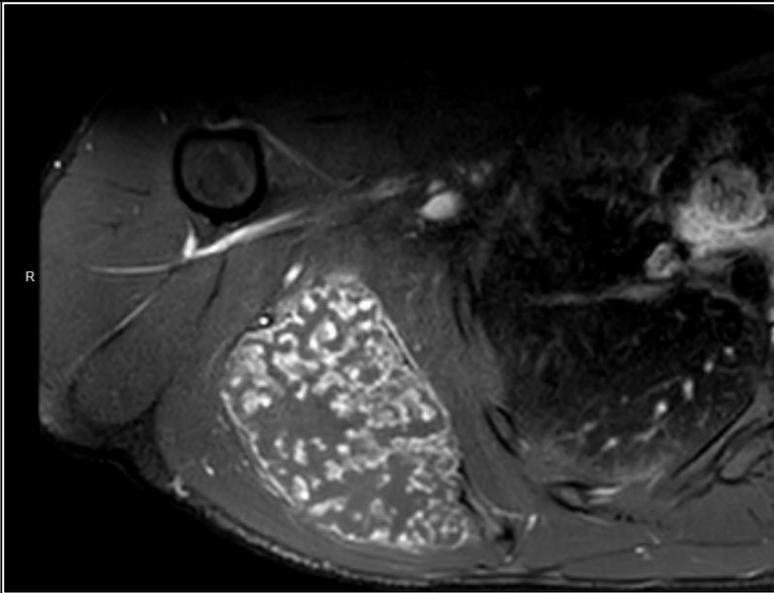
Large expansile destructive lesion [6.9 x 9.5 x 7.4 cm (AP x TV x CC)] within the scapular body with scattered internal mineralization.

# MRI Upper Extremity (Unlabeled)

Axial T1 pre-contrast



Axial T1 post-contrast

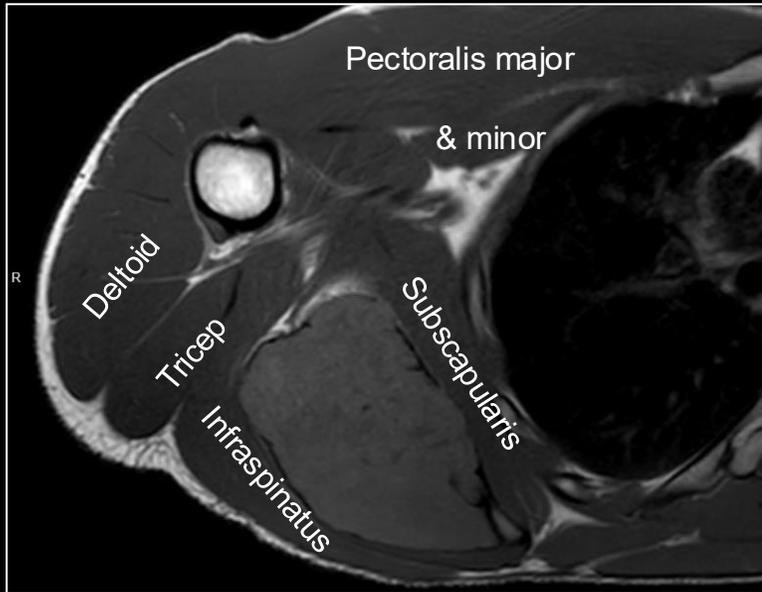


Sagittal T2 pre-contrast

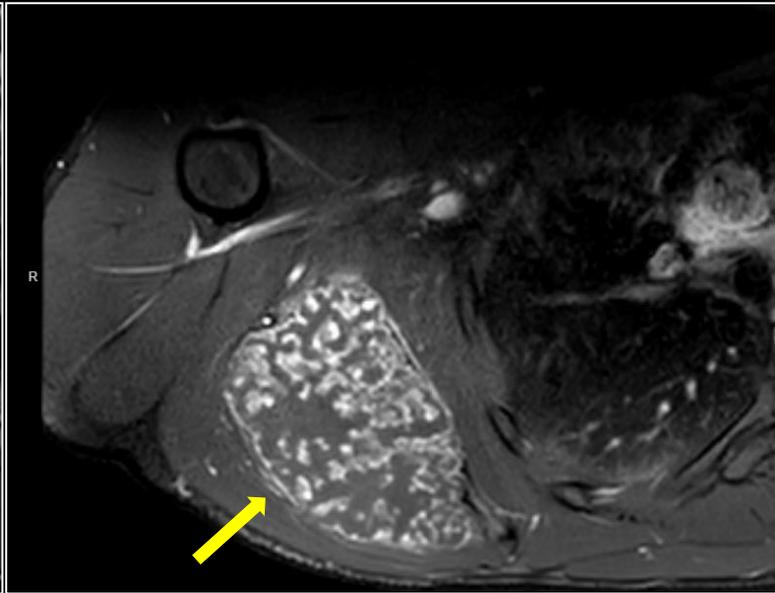


# MRI Upper Extremity (Labeled)

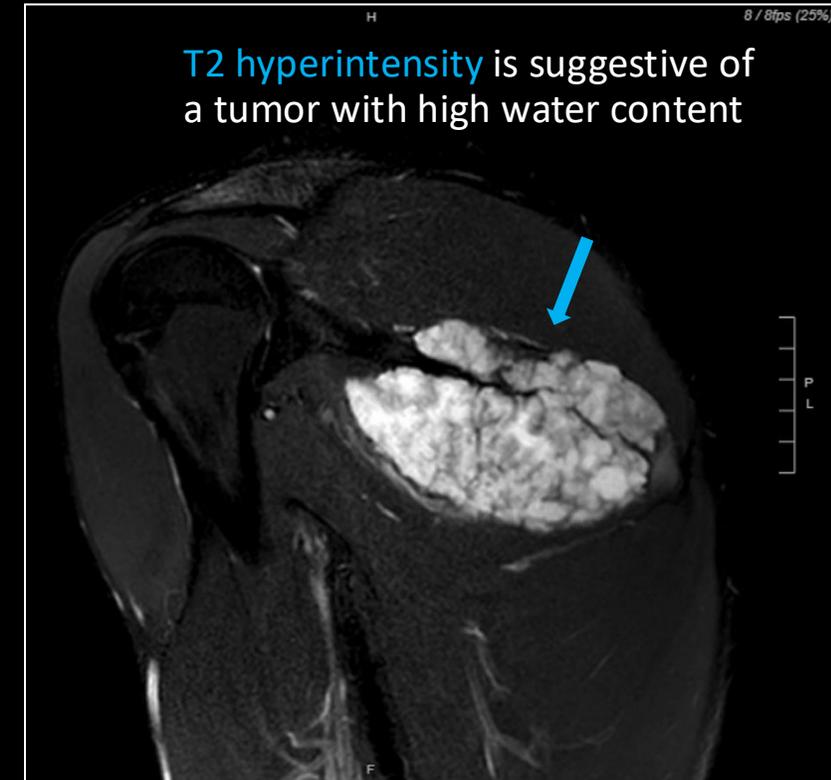
Axial T1 pre-contrast



Axial T1 post-contrast



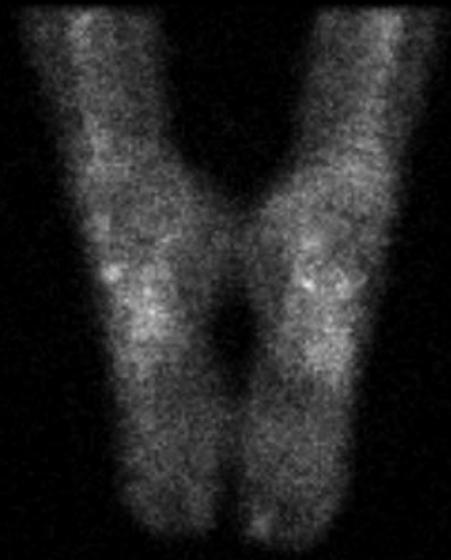
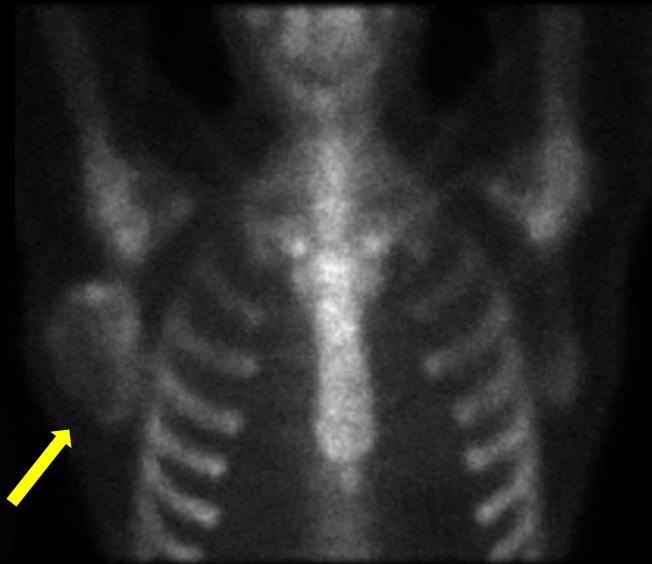
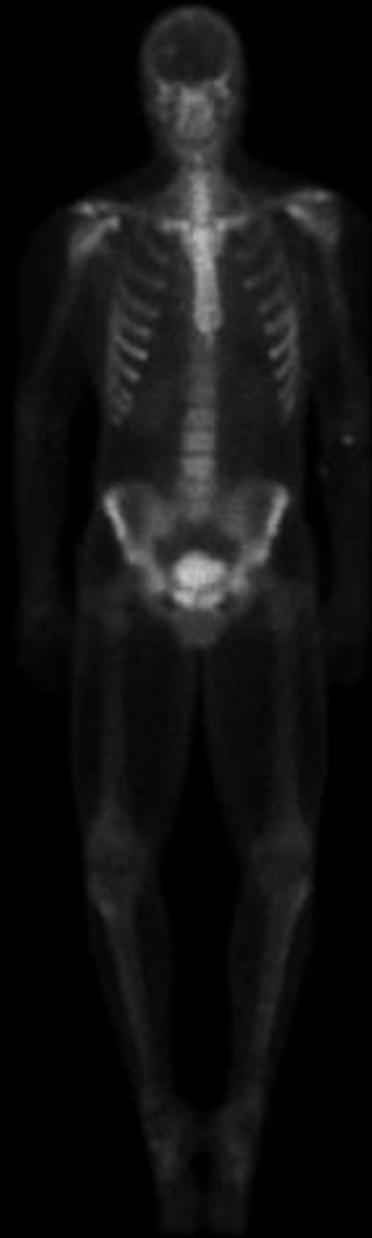
Sagittal T2 pre-contrast



## Findings:

Between the infraspinatus and subscapularis muscles is a multilobulated **T1 hyperintense**, **T2 hyperintense** mass with a T1 and T2 hypointense rim and internal curvilinear areas of T1 and T2 hypointensity. This is an expansile and destructive mass arising from the scapular body, measuring 10.0 x 5.9 x 8.7 cm (TV x AP x CC). No surrounding soft tissue edema. No muscle invasion.

# Tc-99m Bone Scan



Tracer uptake associated with the known lesion of the right scapula

# Differential Diagnosis

- Benign

- Osteochondroma
- Enchondroma
- Chondroblastoma
- Fibrous dysplasia
- Giant cell tumor

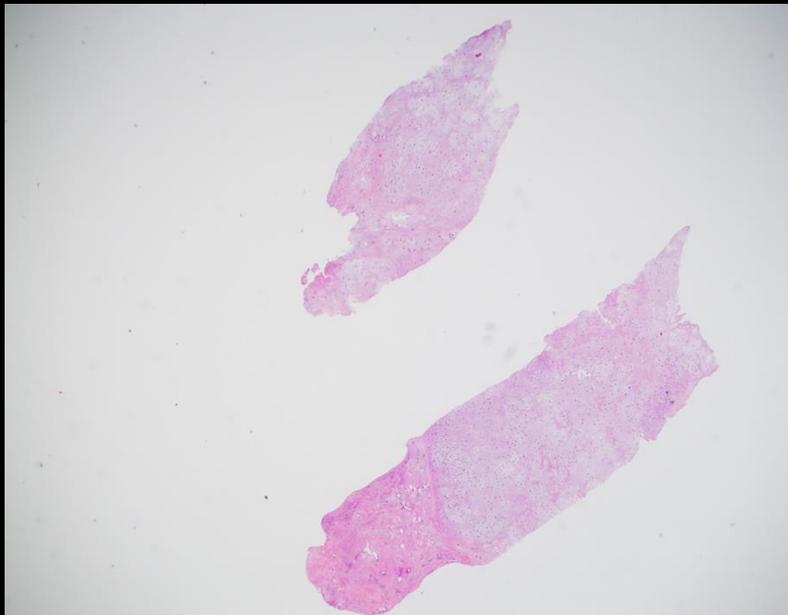
- Malignant

- Osteosarcoma
- Ewing sarcoma
- Chondrosarcoma
- Lymphoma

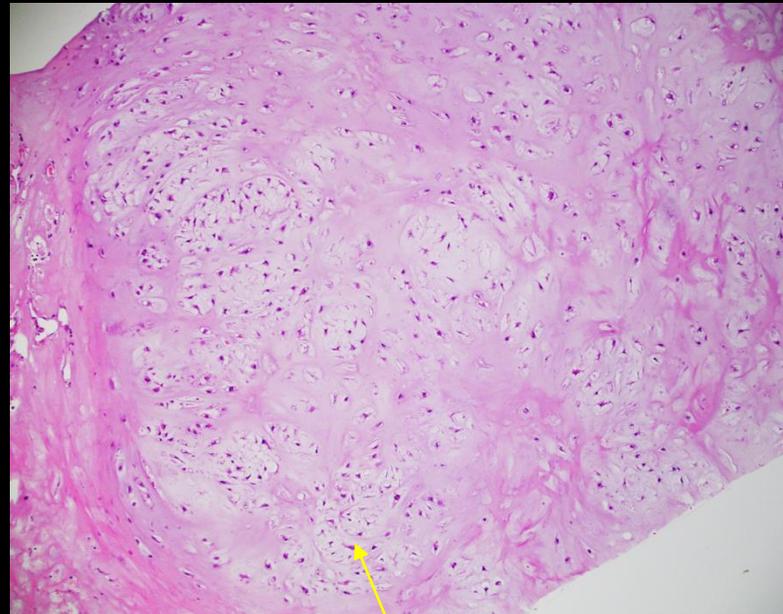
Surgical excision of the tumor was performed, and the tumor was sent to pathology

# Micro Path

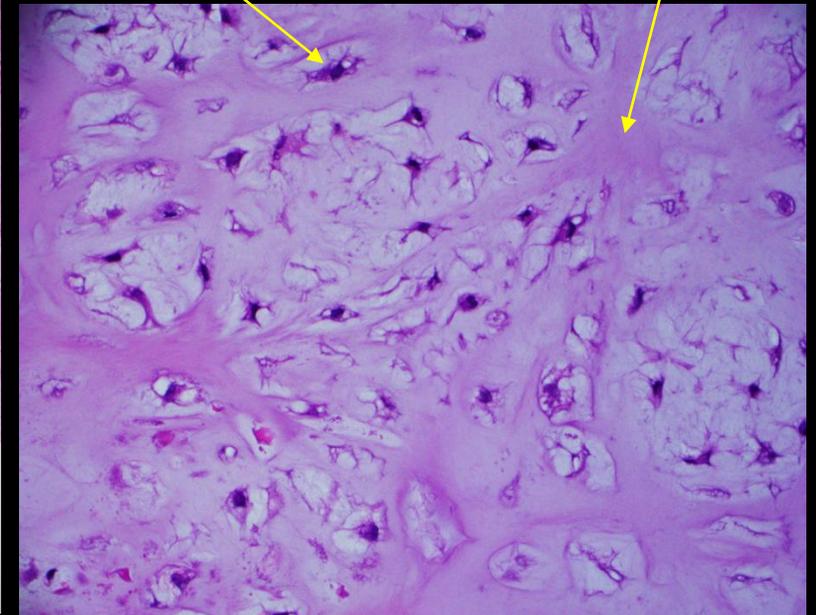
Core needle biopsies



4x



10x



40x

There is nuclear atypia of chondrocytes and abundant cartilaginous matrix with chondrocytes embedded in lacunae

There is increased cellularity of chondrocytes

# Chondrosarcoma

Malignant mesenchymal tumor producing chondroid (cartilaginous) matrix

**Final Dx: Localized G1-2 conventional chondrosarcoma of the scapula**

## Pathology

- Grossly
  - Lobulated, solid, firm, gray-tan, fleshy mass
  - Contains scattered gritty white calcifications (mineralized cartilage)
  - Arises in the medullary cavity or on the bone surface
  - Often causes cortical destruction and extension into the soft tissue
- Histologic
  - Lobulated architecture with hyaline cartilage matrix
  - Low-grade tumors show bland chondrocytes in lacunae
  - Higher-grade tumors have increased cellularity, mitotic activity, and nuclear atypia

# Chondrosarcoma

Malignant mesenchymal tumor producing chondroid (cartilaginous) matrix

## Epidemiology

- Most common in adults between 40 – 70 years old
- Slight male predominance
- 2<sup>nd</sup> most common primary malignant bone tumor (after osteosarcoma)
- Often develops in flat bones (pelvis, ribs, femur, humerus)
- Can arise de novo or secondary to pre-existing benign cartilaginous neoplasms

## Treatment

- Surgical resection: wide local excision with negative margins
- Typically slow growing and thus resistant to chemotherapy and radiation
- Potential for molecular features (IDH, COL2A1 mutations) as future therapeutic targets

# Chondrosarcoma

Malignant mesenchymal tumor producing chondroid (cartilaginous) matrix

## 2020 WHO classification of chondrogenic bone tumors

Benign	Intermediate	Malignant
Subungual exostosis	Synovial chondromatosis	Chondrosarcoma, grade 1
Bizarre parosteal chondromatous proliferation	Atypical cartilaginous tumor	Chondrosarcoma, grade 2
Periosteal chondroma		Chondrosarcoma, grade 3
Enchondroma		Clear cell chondrosarcoma
Osteochondroma		Mesenchymal chondrosarcoma
Chondroblastoma		Dedifferentiated chondrosarcoma
Chondromyxoid fibroma		
Osteochondromyxoma		

## Grades

- G1 = locally aggressive, rarely metastasize
- G2 = intermediate
- G3 = aggressive, metastatic potential

## Prognosis (5-year survival)

- G1: ~85%
- G2/3: ~50%

\*Local recurrence is more common than distant metastasis and is related to tumor size and adequacy of surgical margins

# Chondrosarcoma

Malignant mesenchymal tumor producing chondroid (cartilaginous) matrix

## Imaging Features

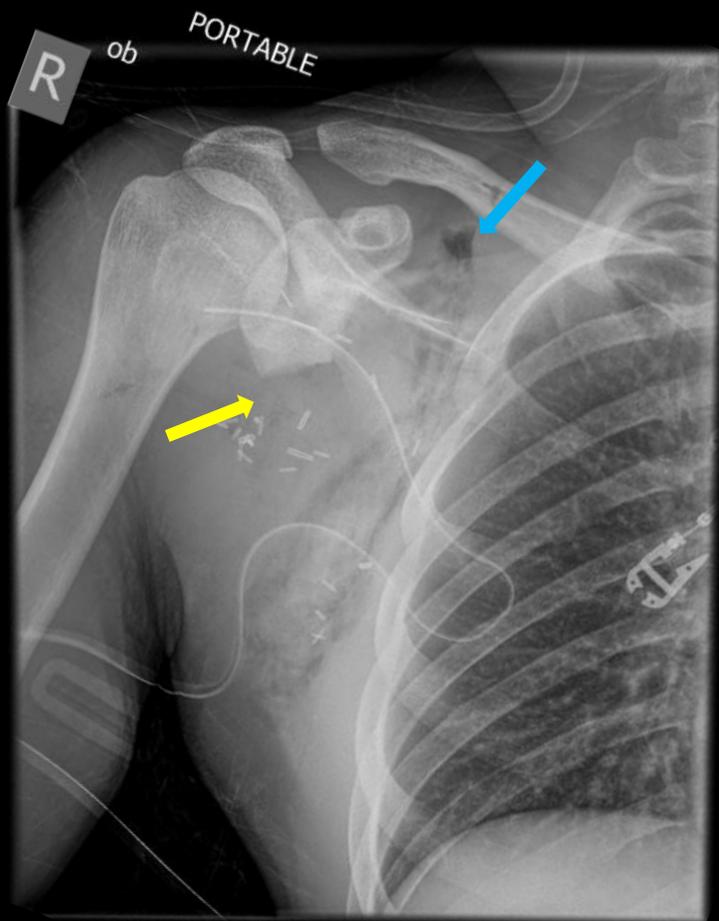
### **Conventional chondrosarcomas**

- Mixed lytic and sclerotic appearance on radiographs
- Water-rich hyaline cartilage (bright on T2-weighted images)
- Well-differentiated chondrosarcomas
  - Characteristic ring-and-arc chondroid matrix mineralization
- Higher-grade chondrosarcomas
  - Less matrix mineralization; more amorphous or stippled appearance

## Key diagnostic considerations

- Differentiating benign from malignant cartilage tumors is crucial
- Increased biologic activity: deep and extensive endosteal scalloping
- Aggressive features: cortical destruction and soft tissue masses

# Post-surgery X-Ray



## Findings:

Postoperative changes of **partial right scapulectomy** (wide resection of right scapular body chondrosarcoma).

**Soft tissue gas**, surgical drain, and multiple surgical staples are present.

## Future imaging:

Surveillance CT chest and MRI scapula 3 months post-op.

# References

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